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API REVIEW

API's Review of Recent USGS Pavillion, Wyoming Reports Show USGS Groundwater Sampling Results Differ From EPA's Results in 2011 Draft Report

Two new technical reports[1,2] were released by the United States Geological Survey (USGS) on September 26, 2012 regarding EPA's Pavillion, WY groundwater study and associated December, 2011 report[3]. The USGS reports describe the results of their April-May, 2012 testing of one of the monitoring wells (MW-01) previously sampled by the EPA, and their attempts at sampling monitoring well MW-02. In summary, the USGS did not findthe presence of several key chemical compounds of interest, most notably glycols and 2-butoxyethanol, previously reported to be found in deep monitoring wells MW-01 and/or MW-02 by EPA. Other materials previously found by the EPA were found at significantly lower concentrations by the USGS.

The 2011 EPA Pavillion Draft report[3], which claimed groundwater impact linked to hydraulic fracturing near Pavillion, has come under intense scrutiny by the scientific community [4]. The USGS data does not support any such link. Some of the flawsthat have been identifiedinclude improper monitoring well construction and development; possible cross-contamination of groundwater during EPA monitoring well drilling, development, and sampling; and misrepresentation of monitoring well depths in relation to drinking water well depths in the area[4]. Many of these concerns were validated by the USGS. For example, the USGS was unable to sample one of EPA's deep monitor wells (MW-02) because the well could not yield enough water to produce a representative groundwater sample which is due to improper well construction/ development.

The two new USGS' reports[1,2] underscore the need for transparent peer-reviewed research and the use of proven and tested scientific practices.

USGS recognized the importance of several factors overlooked by the EPA during the development and implementation of the study described in EPA's 2011 report[3]: 1) proper testing and Quality Control/Quality Assurance (QA/QC) procedures; 2) representative samples (to date a representative sample of groundwater from MW-02 has not be obtained); and 3) use of standard analytical testing methods.

USGS' work has raised the bar for sound science in the EPA's Pavillion research, however, some key technical issues still remain requiring review and consideration by the USGS, EPA, and the scientific community. These issues include:

- USGS was to "*...provide an independent perspective of the quality of groundwater pumped from two USEPA monitoring wells located near Pavillion, Wyoming*"[2]. However, based upon the USGS report[1] and backup USGS sampling documents[2], EPA was onsite and may have influencedthe USGS' sampling effort. For example, USGS' fieldnotes [1] collected during the sampling of MW-01 indicate not all samples were collected as planned by the USGS due to the EPA limiting access and time for full USGS sample collection.

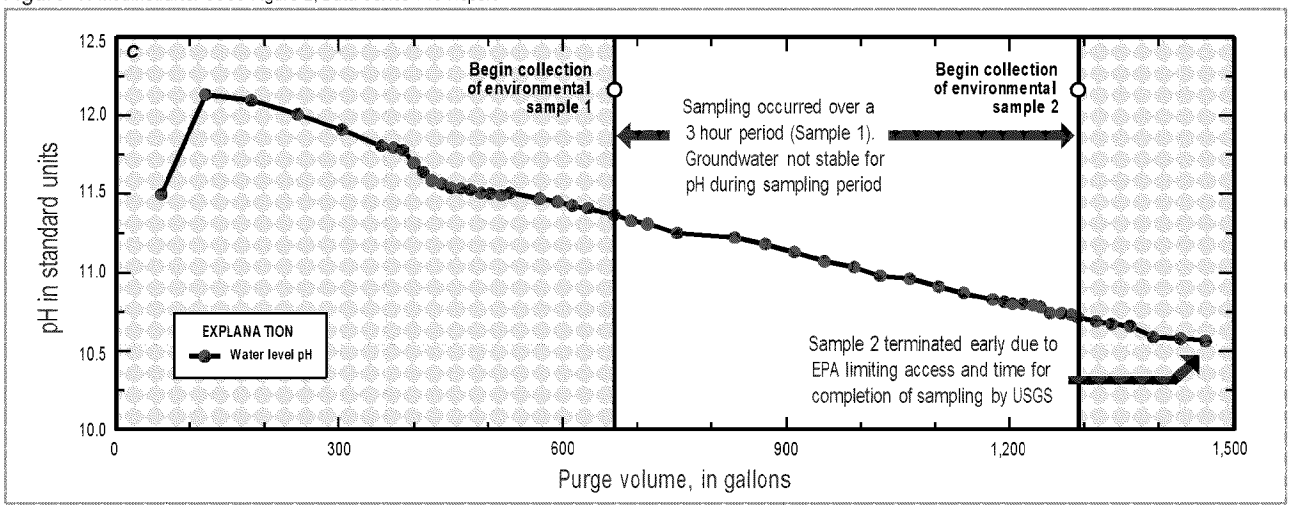
- USGS did not provide technical interpretation of the data, but rather was requested by a cooperative agreement with Wyoming[5] to provide those results to the panel tasked with looking at the broader EPA study. USGS did provide one key findingin its Data Series Report [1]: *"One compound of interest in the Pavillion area, 2-butoxyethanol, was not identifiedin the TIC analyses for any of the environmental samples."* In addition, USGS reported that toluene, xylene, isopropanol, diethylene glycol, triethylene glycol, and acetone were not found in groundwater from well MW-01. These compounds were reported in this well during the previous EPA sampling activity[3].

- USGS sampled for a large variety of parameters (e.g., organics, metals, radionuclides), none of these parameters were detected at levels that exceeded EPA primary health-based drinking-water Maximum Contaminant Levels (MCLs). The chloride level in groundwater from MW-01 was 27 part per million (ppm), well below the EPA secondary MCL of 250 ppm. The methane, ethane, propane, and similar compounds are likely naturally occurring, and many of these have been detected historically[4] in groundwater in the Pavillion area, a fact that has not been acknowledged by USGS or EPA. MW-01 is located in a very shallow natural gas production area and the presence of methane and other hydrocarbons is not unexpected.

- USGS issued (September 26, 2012) a Sampling and Analysis Plan[2] (SAP) to support its sampling efforts at Pavillion, which is normally prepared in advance and outlines sampling, testing, and QA/QC procedures. USGS appears to have revised this SAP following completion of their April-May, 2012 sampling activities, which is highly unusual. It is recommended that all revisions of the USGS SAP be provided to the public. Field notes and observations should be part of the data report and not in the SAP.

- USGS was unable to meet standard USGS and best practice sampling/purging methods for monitoring well MW-02 due to completion/development problems encountered during the April-May, 2012 USGS investigation. EPA, in spite of USGS's valid reasons for not sampling well MW-02, collected a sample of groundwater from MW-02 on April 22, 2012 and sent those samples for analyses. This fact was not discussed

Figure 1. Modified after USGS Figure 2, Data Series 718 Report [1]



in the USGS Data Series Report 718[1], and was found within the revised USGS SAP[2]. EPA's sampling of monitoring well MW-02 should have been disclosed and discussed in USGS Data Series Report[1]. It is unclear whether USGS was present during the MW-02 sampling, however, fieldnotes – USGS and/or EPA - from this event should be provided to the public.

- USGS committed to posting important age-dating analytical results not discussed in its report on their National Water Information System (NWIS) website[7]. To date (October 8, 2012) no data has been posted, almost 5-1/2 months after sampling occurred.

- USGS' SAP[2] specified a criterion for sampling that required the pH of the groundwater to be stable for sampling. A review of the USGS data presented in the report[1] shows, as depicted in Figure 1, pH stabilization did not occur during sampling, and the graph suggests that well MW-01 is likely still being impacted by high pH cement and/or drilling fluids used during monitoring well drilling or construction.

- USGS noted in the SAP[2], but not in their Data Series Report[1], that a 4-inch *"black painted/coated carbon steel casing"* was used in the construction of monitoring wells MW-01 and MW-02. Paint can contain a wide variety of organic and metal compounds, and it is not sound scientific practice to use painted/coated casing or materials in any environmental monitor well completion for this reason. Further, pictures provided in the EPA 2011 Draft report show what appears to be a blue-painted sand catcher above and in contact with the well screen. These very important facts had not previously been disclosed by the EPA. EPA has since acknowledged the agency had previously provided erroneous monitoring well construction information.[6] The quality of all sample results from EPA's deep monitoring wells are questionable given the identified construction issues.

CONCLUSION

In summary, the most significant key finding of the USGS investigation at Pavillion is that most of the key indicator compounds that the EPA claims show a possible link between hydraulic fracturing and supposed groundwater contamination were not found in the USGS samples, and thus the USGS results are inconsistent with EPA's results of 2011. The original purpose of the EPA efforts at Pavillion was to investigate possible sources of residential water well odor and taste complaints by some residents. No connection to odor and taste has been established and none of the key organic compounds reported in the EPA and USGS studies have been found in the domestic wells. The results presented in the USGS report clearly show there is room for improvement regarding EPA's transparency with key information that would be of extreme importance in evaluation of its own reports by the scientific community.

[1] "Groundwater-Quality and Quality-Control Data for Two Monitoring Wells near Pavillion, Wyoming, April and May, 2012", USGS Data Series Report 718, 2012.

[2] "Sampling and Analysis Plan for the Characterization of Groundwater Quality in Two Monitoring Wells near Pavillion, Wyoming", USGS Open-File Report 2012-1197.

[3] "Investigation of Ground Water Contamination near Pavillion, Wyoming", EPA 600R-00/000, December 2011.

[4] "Review of U.S. EPA's December, 2011 Draft Report: Investigation of Groundwater Contamination near Pavillion, Wyoming", April 26, 2012, S.S. Papodopulos and Associates.

[5] http://www.usgs.gov/newsroom/article.asp?ID=3410

[6] http://trib.com/news/state-and-regional/epa-extends-pavillion-d ata-comment-deadline/article_1c308f56-31b6-58ae-90c0-99000e5d7a58.html?comment_form=t rue

[7] http://waterdata.usgs.gov/nwis